

Applying Big Data techniques to Uncommanded Roll

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Sharing your data is selfless

Sharing programmes should be interoperable

“Big Data” techniques help



(Big) Data Analysis Components

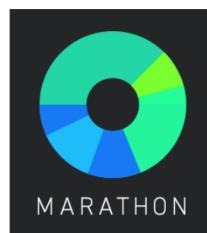
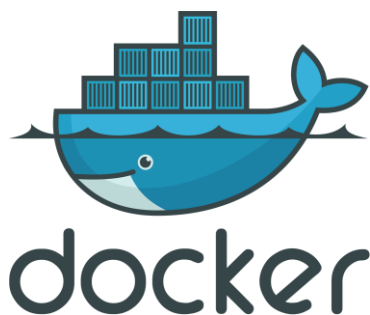
Infrastructure

Data Science



Aviation Domain





&



MESOS

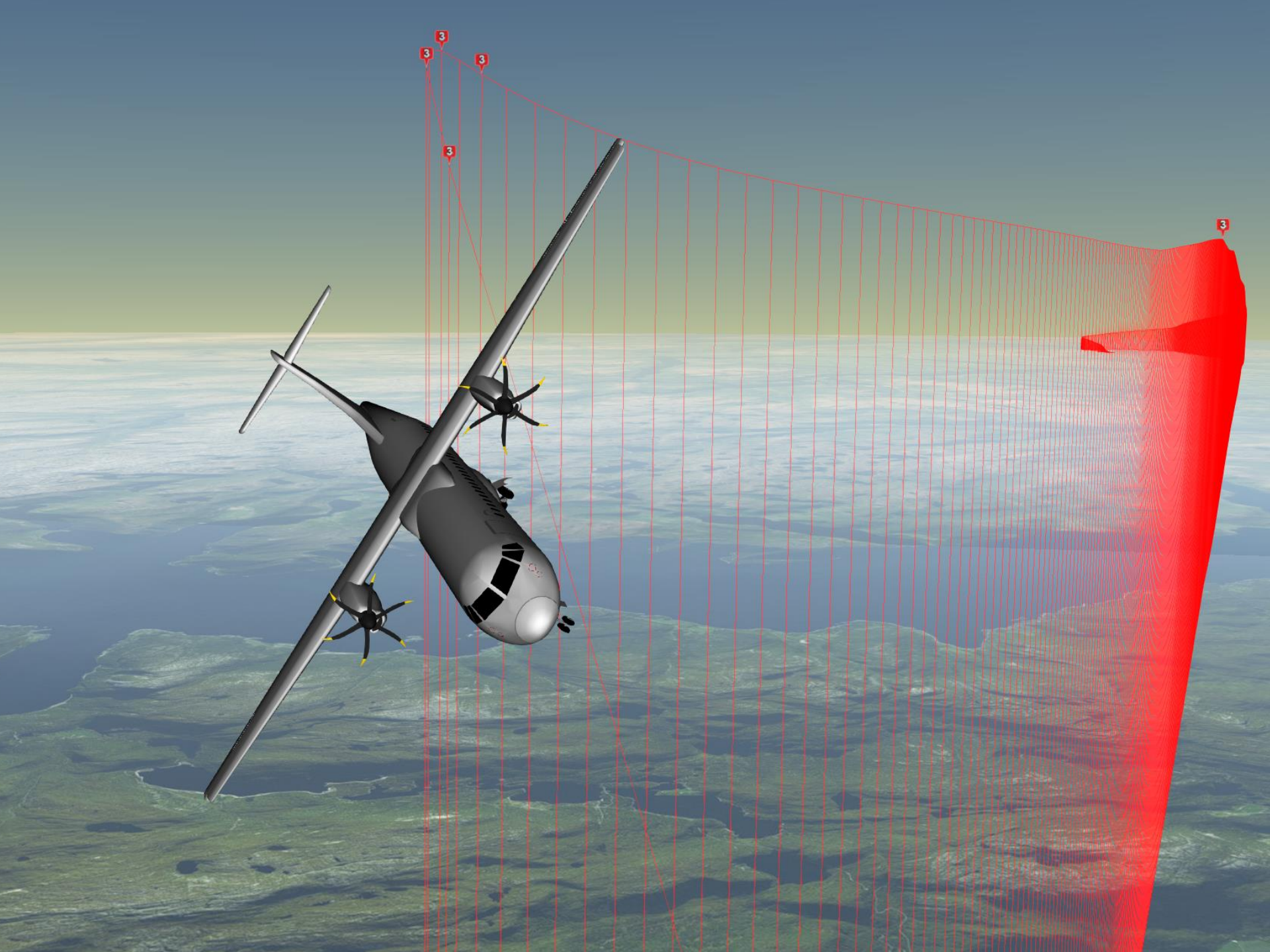
Uncommanded Roll



2 incidents in 1 month

Different operators / fleets

Had this happened before?



The Data



Aileron and Roll Rate for 1,000 normal flights

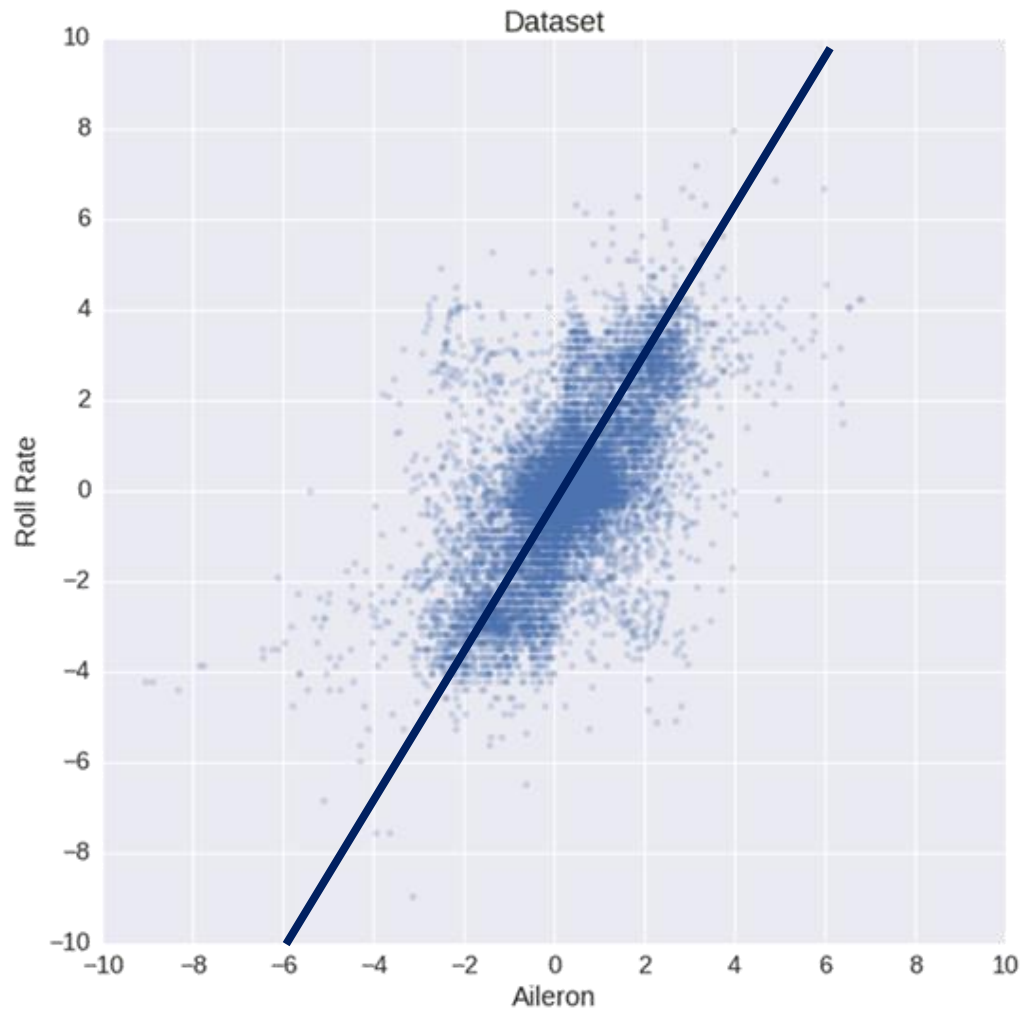
> 1,000ft AAL

> 5° Bank Angle

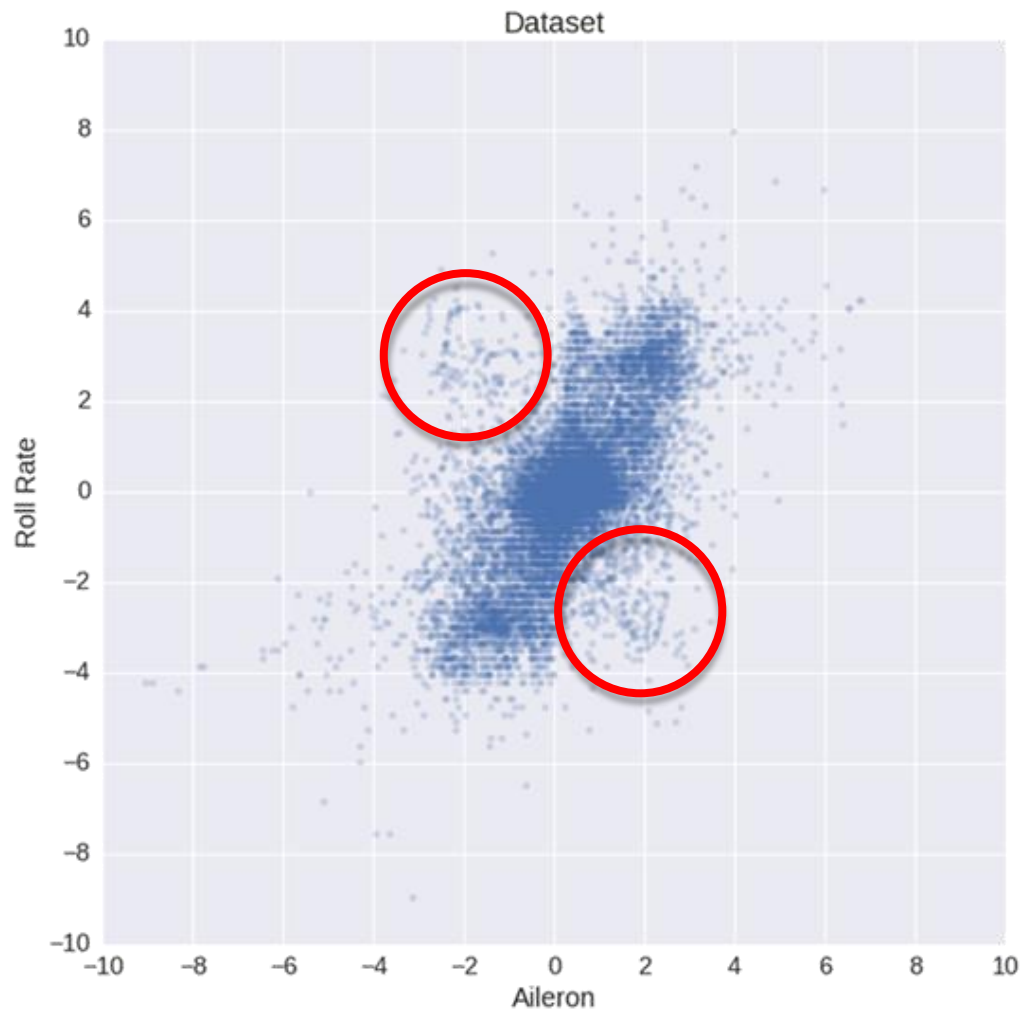
Average 280 samples per flight

Trained on 280,000 data pairs

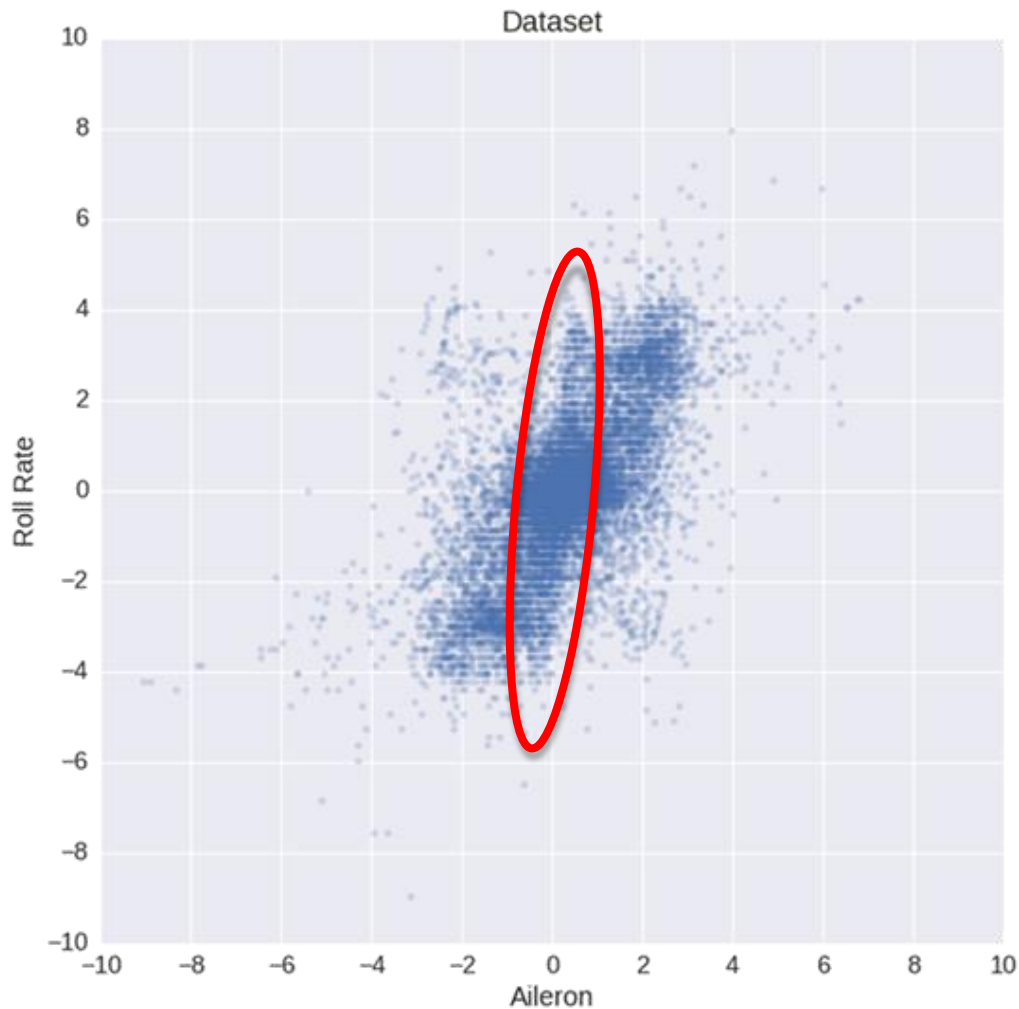
Linear relationship?



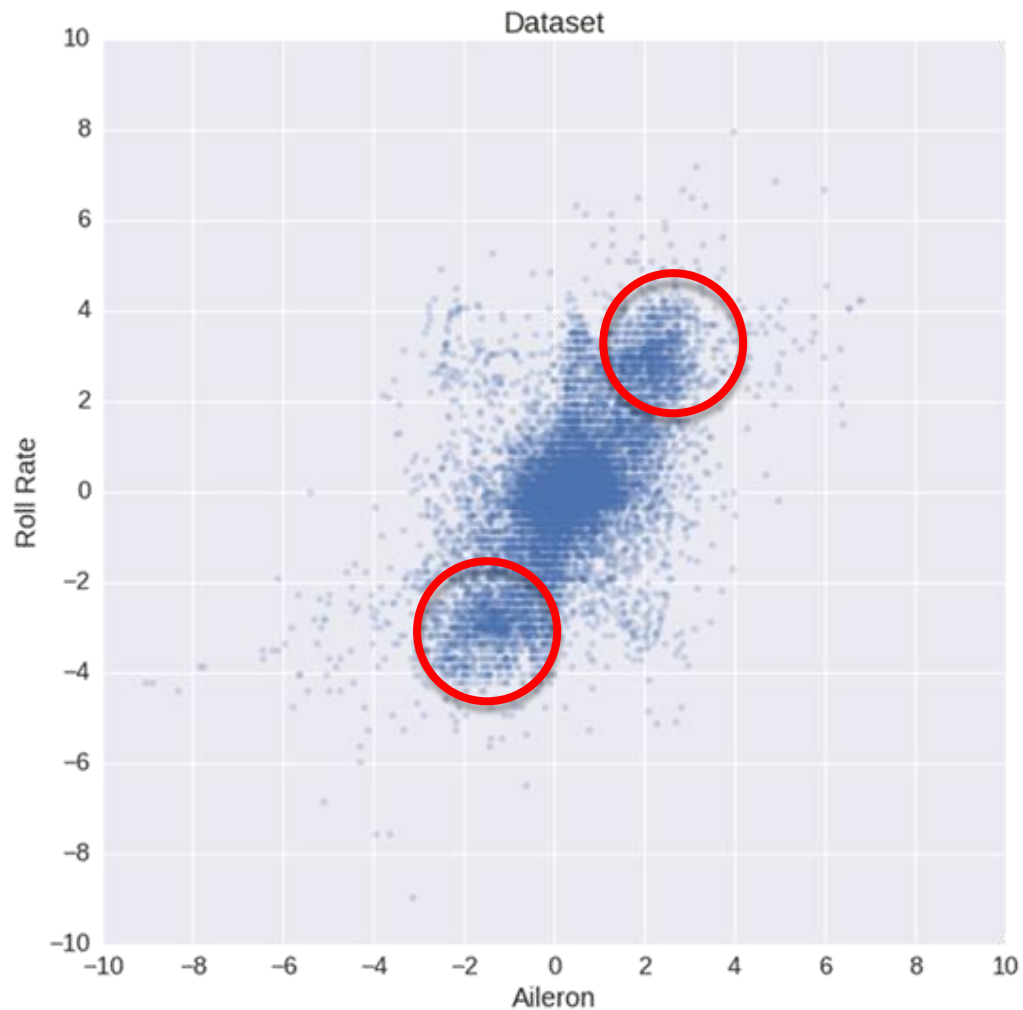
Flipped signal?



Residual roll rate?



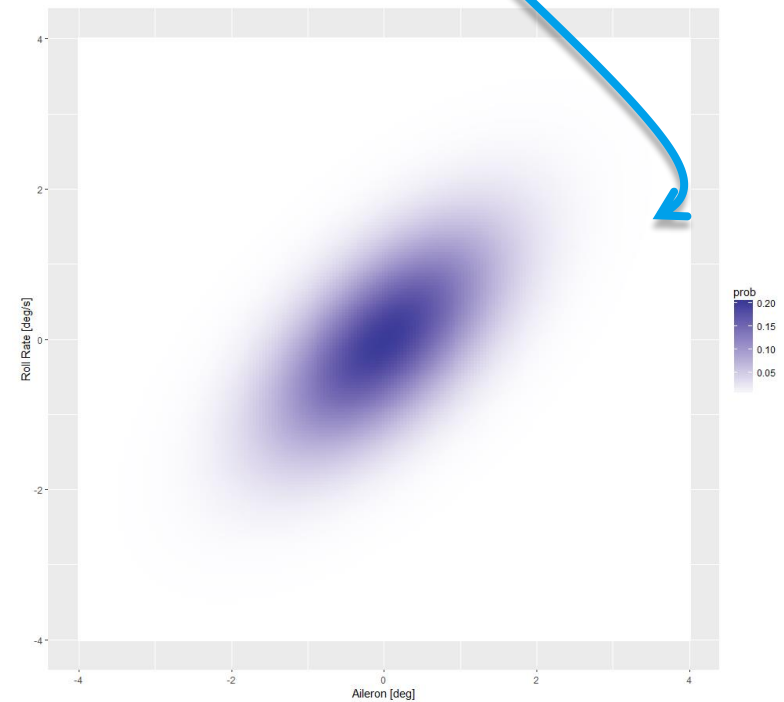
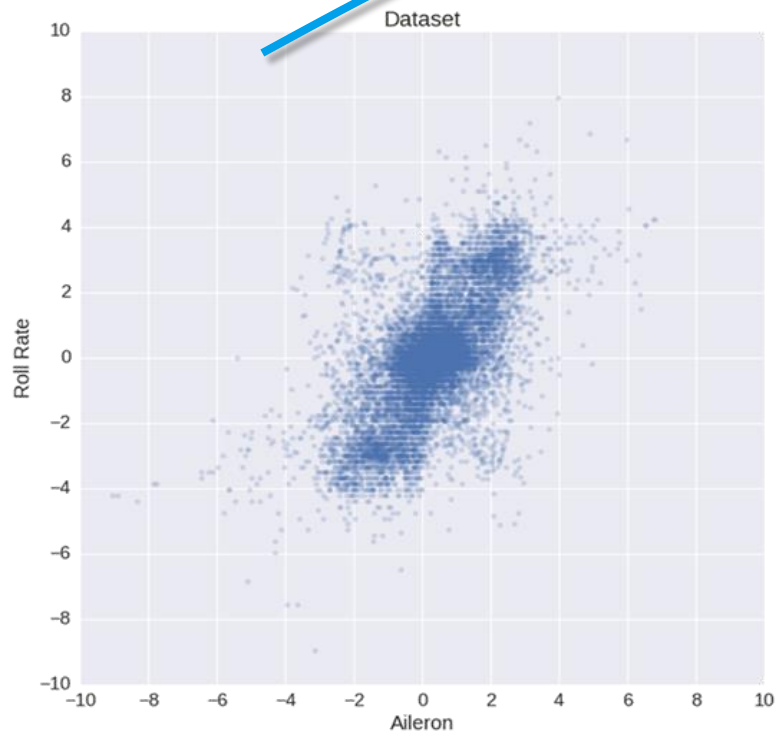
Coordinated turns?



The model

Covariance matrix

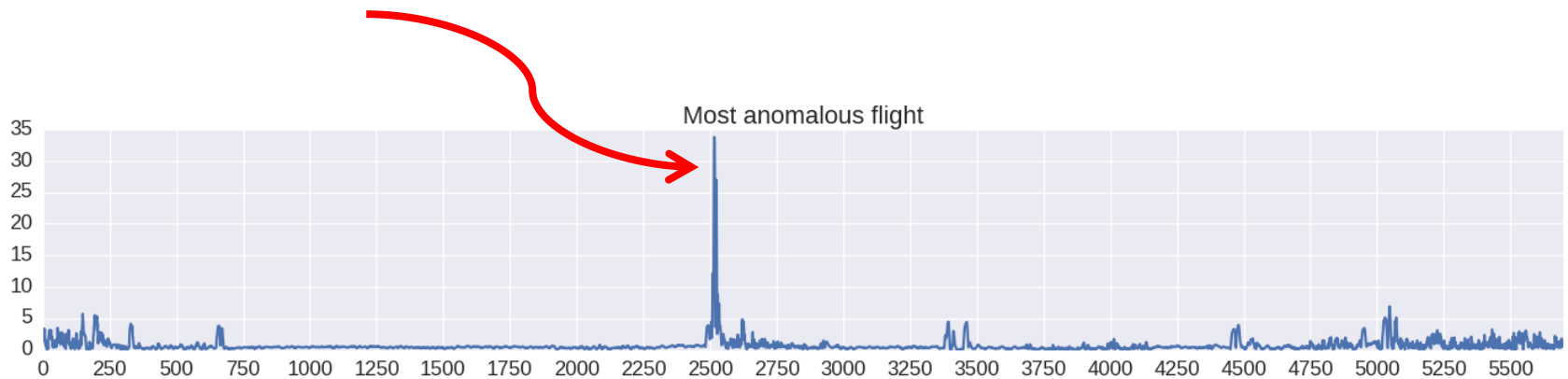
$$\Sigma = \begin{bmatrix} 1 & 0.61 \\ 0.61 & 1 \end{bmatrix}$$



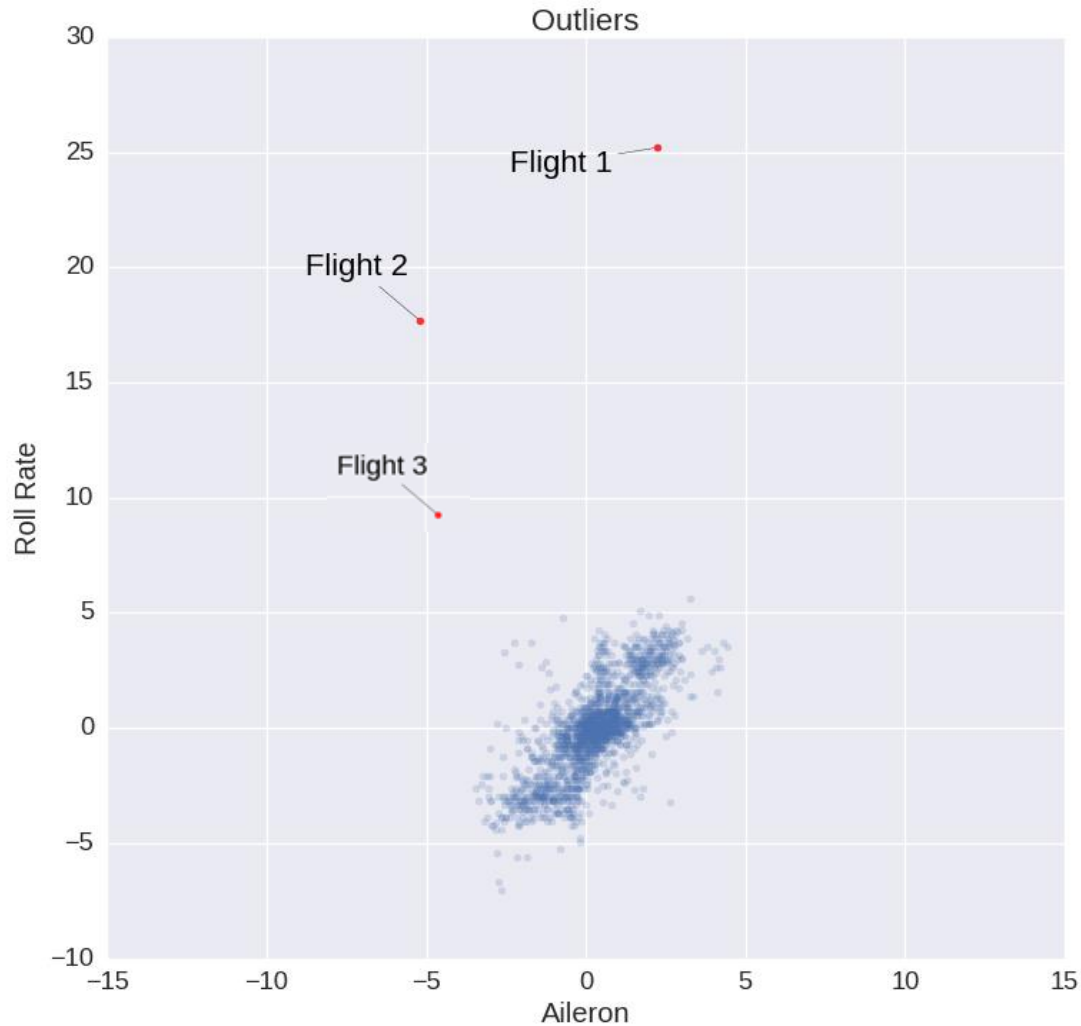
Testing phase



- Mahalanobis distance from the cloud throughout the flight
- Worst seen disturbance:



Maximum distance for 225,000 flights



Conclusions



- Model relates roll rate to aileron movement
- 225,000 flights evaluated
 - Two known disturbances were identified
 - One unknown disturbance identified
 - Other less significant ones, depending on resources
- Simple model is fast and effective
 - Work required to support Flaperons and Helicopters
- Distribution across 196 cores completed in 1 hour



Thank you!

